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Circular No. 13.
15,000, July, 1909.

Elementary Agriculture and Horticulture and School Gardens

In Rural and Village Public and Separate Schools.

Explanatory and Descriptive Circular.

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO.

ONTARIO
DEPARTMENT OF EDUCATION

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Ministry of Education, Ontario
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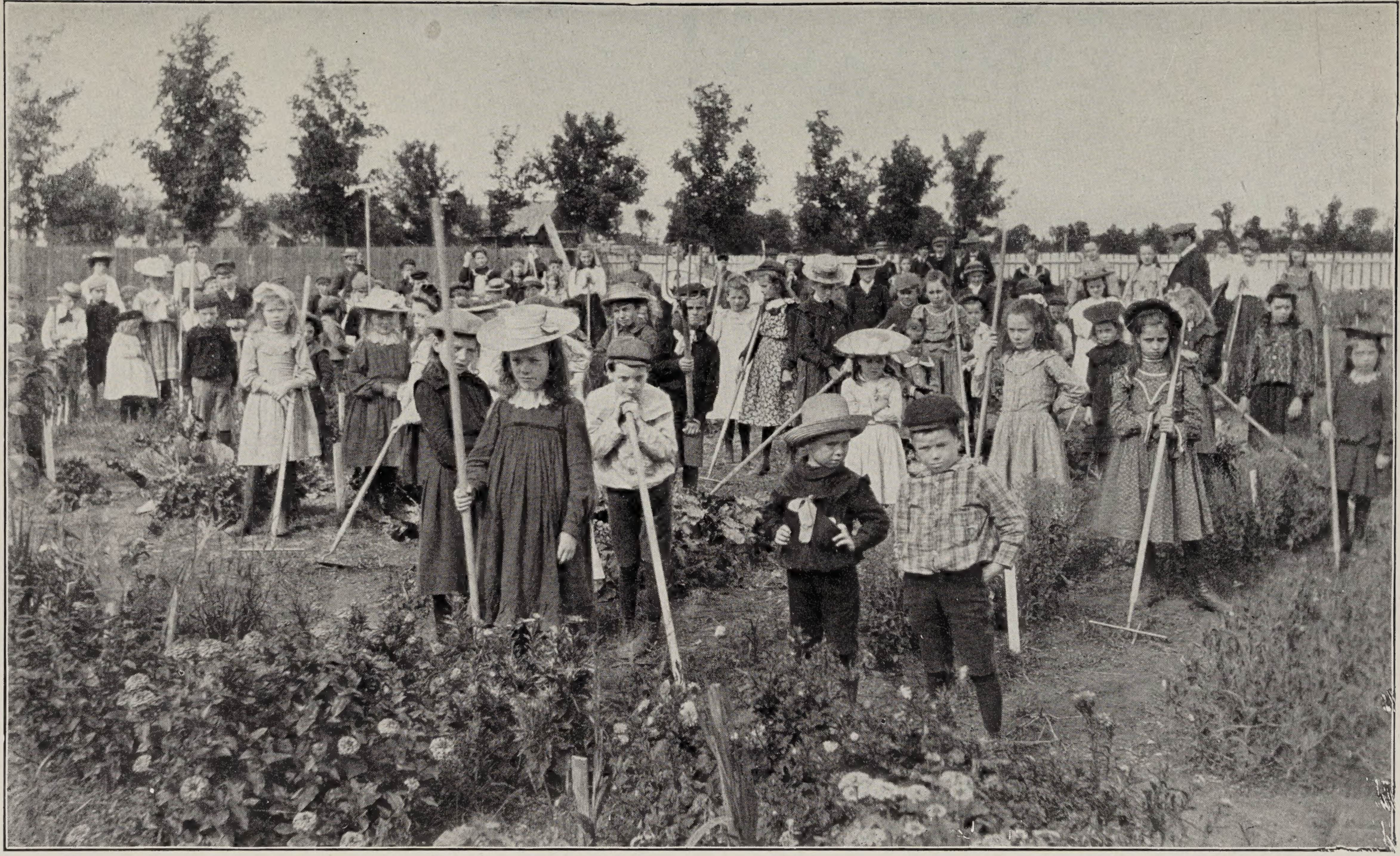

A Hundred Gardeners, Rural School Gardens, Richmond.

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Elementary Agriculture and Horticulture in Rural and Village Schools.

I. REGULATIONS.

(1) A rural school board, or a school board of a village, that provides and maintains satisfactorily to the Minister of Education, a School Garden, with a course in Elementary Agriculture and Horticulture under a teacher with a Departmental certificate in these subjects, shall be paid by the Minister an initial grant not exceeding $50 and a subsequent annual grant of $30 from any appropriation made by the Legislature for this purpose.

(2) The school board shall provide the necessary tools and other requisites, with facilities for storing the same when not in use.

(3) The accounts of the course in Elementary Agriculture and Horticulture shall be kept separate from the general school expenditure, and the grants made shall be spent solely for this course.

(4) Much of the work of the course in Elementary Agriculture and Horticulture may be taken up out of school hours, but a definite place must be provided for it in the time table, satisfactory to the Inspector.

(5) On the report of an Inspector detailed for the purpose by the Minister, that the organization and teaching are satisfactory, an annual grant of $30, in addition to the regular salary paid by the School Board, will be paid by the Minister to a legally qualified teacher who holds a certificate in Elementary Agriculture and Horticulture and who gives instruction in accordance with the Regulations of the Department of Education.

II. GENERAL AIMS.

To stimulate interest in rural life;

To provide healthful exercise for body and mind, and to afford to the pupil an opportunity to direct his activities along useful lines;

To develop at an early age habits of industry, respect for labour, and a love for productive and constructive work;

To impart useful information in agricultural subjects;

To give facility in the handling of tools and in the practice of garden craft;

To promote the desire to improve home surroundings and to train boys and girls to do such work with efficiency;

To promote the qualities that make for good citizenship, such as the responsibility of ownership, respect for public property, consideration for the rights of others and the principle of co-operation in seeking the common good;

To encourage careful observation of nature; thus enabling the pupil to understand his environment and to appreciate more fully the beautiful in nature;

To promote a spirit of independent investigation in other branches of study;

To bring the life and interests of the school more closely into touch with the home life of the pupils.

III. ORGANIZATION.

Location of the Garden.—So as to be easily accessible, the garden should be convenient to the school room. If possible, it should be situated in a part of the grounds that can be seen from the windows of the Principal's class-room. The safety of the garden as well as the convenience of the pupils should be kept in mind. Accordingly, the garden should not in any way interfere with the usual outdoor games. Accordingly, also, either a strong hedge or a woven-wire fence should divide the garden from the play-ground. If the garden has a southern exposure so much the better; if not, protection from storms and cold north winds may be secured by planting along the north and the west sides a wind-break of evergreens. Such planting should not be allowed to shut out a fine view from the school building; but, in some cases, it might be used to advantage to shut out unsightly or objectionable features outside the grounds. When practicable, the garden should be placed where it can be seen from the street or highway. It should be in harmony with the natural features of the grounds; or, in other words it should occupy that place in the grounds where it will look best.

Size of the Garden.—No school is too small to have a garden of some kind. The area of the garden does not determine its success. The best garden is the one the teachers and pupils have been most deeply interested in making.

The area of the garden will depend largely upon the area of the available grounds and upon the number of pupils taking part in the work. In a large graded school where the size of the garden is limited it may be arranged that gardening be taken up in certain grades only. The area will also be determined in part by the nature of the work carried on. Individual plots of flowers or vegetables require least space and are the all important feature. Larger class plots may be added for the growing of vegetables or grains that cannot conveniently be cultivated in small plots; and, if the garden is large enough, experimental plots in connection with farm crops, as well as forestry and fruit plantations, may be included.

A school ground one and one-quarter acres in extent might be divided up as follows: Boys' playground, $\frac{1}{2}$ ac.; girls' playground, $\frac{3}{8}$ ac.; front lawn, approaches, etc., $\frac{1}{8}$ ac.; pupils' plots in vegetables and flowers, $\frac{1}{8}$ ac.; field experiments, fruit and forestry plantations, $\frac{1}{8}$ ac.

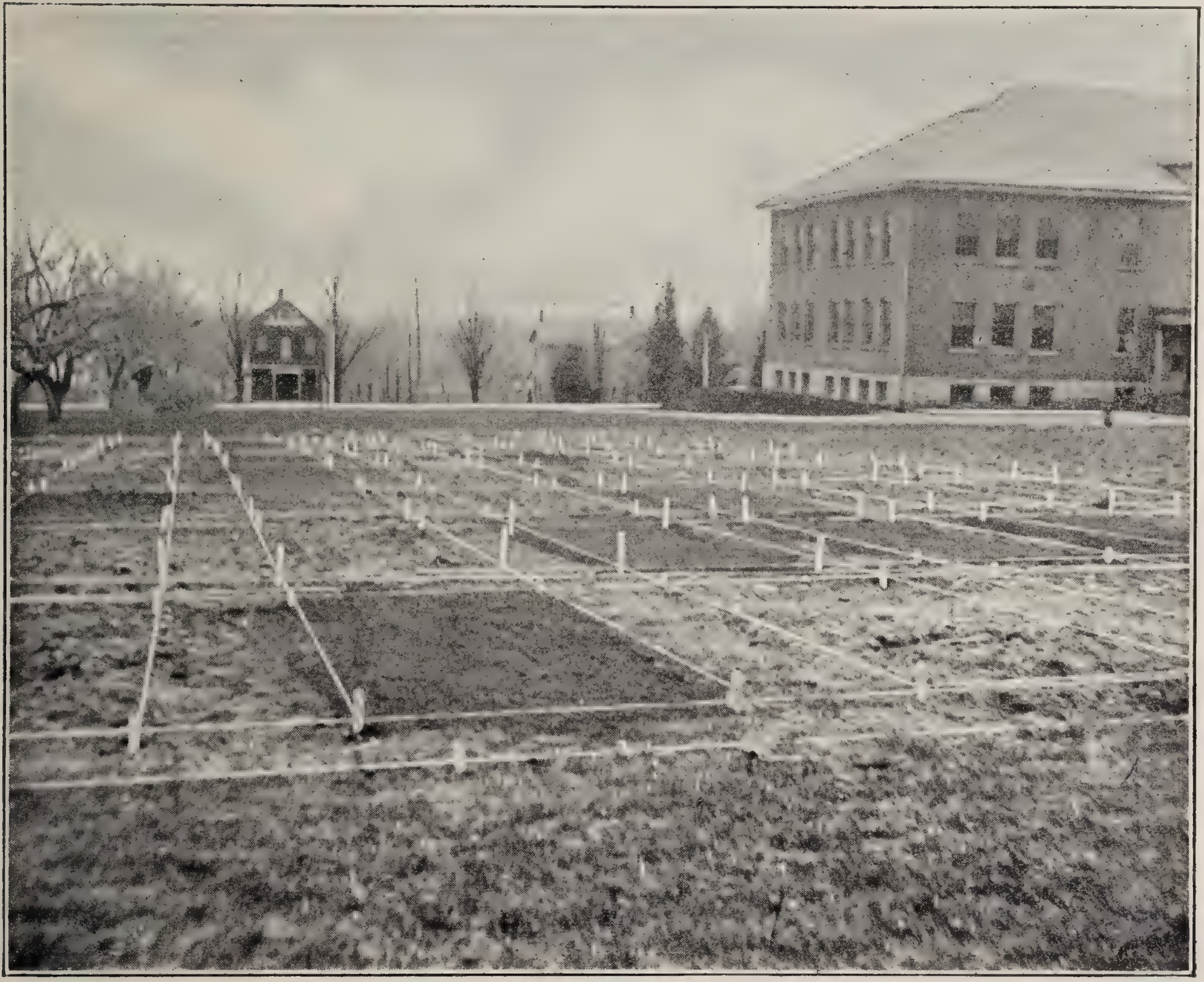
Size of Plots and Paths.—The size of school garden plots will depend very largely upon the character of the work carried on and the age or ability of the pupils. For pupils in primary classes plots 3 to 5 ft. × 5 ft. are very satisfactory; for higher classes 3 to 5 ft. × 10 ft. It will be noticed that the above plots have one dimension in common, viz., 5 ft. wide. This provision becomes more important as the plots are increased in number.

Class or experimental plots may vary from 10 ft. square to 20 ft. square, according to the amount of land available. Every garden should

Rural School Gardens, North Gower.

have a "teacher's plot" which might be regarded as the standard of excellence. A walk at least 4 ft. wide should run all around the garden. Paths 3 ft. wide should run between class or experimental plots and between rows of individual plots. Narrow paths (2 ft. wide) should separate individual plots in the same row. When once the paths and plots have been made and the corner stakes driven, they should not again be disarranged. The plots should be spaded in the fall, no horses being needed in cultivating the garden after the first year.

Garden Plans.—When the extent of the space available for the garden has been ascertained it is advisable to prepare a plan of the garden on paper which will show the exact size and location of the plots required. Such plans should be made with deliberation early in the spring before planting operations begin, and the pupils should be allowed to co-operate in the work. In addition to this general garden plan each pupil should make a plan of his or her own plot or plots, showing where the different varieties of plants chosen are to be grown. This exercise may form a suitable introduction to map-drawing. Each pupil should have a garden note-book in which to record work done and observations made day by day. Such garden diary should contain a plan of the pupil's plots drawn to a scale and showing the arrangement of the plants in each plot.



Garden staked off for 54 individual plots, each 4 ft. × 10 ft.
Cross paths 3 ft. wide, paths running up and down 2 ft. wide.
Dimensions of garden, 38 ft. × 120 ft.—about one-tenth acre.

Laying Out the Garden. —The chief requisites for laying out the garden are a tape-line, long garden lines, a supply of small stakes 1 inch square and 1 ft. long, and a hatchet or mallet to drive them down. The stakes for the large plots might be larger than these, and might be made by the boys at home or in the school work-room, if the school is fortunate enough to have such a room. The outside corners or main boundaries of the garden should first be located and marked with strong stakes. The outside walks should then be staked off, space for a border of flowering perennials measured off, and then the individual plots, class and experimental plots, etc., in the order mentioned, the stakes being driven at the points which are to be the corners of the plots and being kept in perfect line in both directions.

Preparing the Plots.—The planning and staking out of the garden will, of course, be done by the teacher and the pupils. The making of the paths and the preparation of plots in a large garden, however, will usually necessitate the services of a competent man. Most of the boys and many of the larger girls will prepare their own plots with ease and despatch when they have once been shown how to do the work. The smaller boys and girls will need some assistance. In an ordinary garden the older boys may help the girls and the smaller boys, and hired help will not be needed. The plots should be made the exact size indicated by the four corner stakes. Level cultivation should be followed if the soil is very sandy. Otherwise it is desirable to raise the plots by removing a couple of inches of soil from the paths and placing it evenly upon the plots, which should be made of uniform height, raked level and all edges carefully trimmed with the rake and garden lines. If some well rotted manure is spaded into the plot before raking down, so much the better. Refuse in the form of hard lumps of earth, etc., should be raked out of the paths and removed in a wheelbarrow or used to fill up holes in the garden. In this as in all parts of the work the teacher should insist on care and accuracy. Nothing but the best efforts of the pupils should be accepted in making, planting, and caring for the garden plots.

Fertilizers.—Raw manure, although of higher fertilizing value than well rotted manure, should not be used on a school garden because of the weed seeds that it contains. The best manure is that which has been piled—preferably under cover for two summers. Besides supplying food for plants it improves the physical texture of the soil by increasing the amount of humus which has high water retaining capacity. Where good manure for gardens is scarce and expensive, commercial fertilizers should be used. Experiments to prove the value of these should be carried on by older pupils in the school room with potted plants, using very poor soil or pure sand for the purpose, to which would be added in varying proportions the several standard fertilizers. This is much better from the educational as well as from the economic standpoint, than to buy the so-called "complete" fertilizers. In this connection pupils may discover that certain garden crops require certain fertilizers more than others. This is bound to become a very interesting, as well as a highly practical study. In using a commercial fertilizer, care should be observed in mixing it thoroughly with the soil. After the plots have been spaded in the spring the fertilizer should be scattered over them (a plot 5 ft. x 10 ft. requiring about a pint measure full), and then mixed in with a hoe. To fertilize the plots in a garden, 100 ft. x 100 ft. would require about 100 lbs. of fertilizer. It is impossible to prescribe the most suitable fertilizer for a garden without some knowledge of the chemical and physical properties of the soil. For medium, light, garden soil, however, the following might be found quite satisfactory:—

60 lbs. Bone-meal (or 30 lbs. of superphosphate); 20 lbs. nitrate of soda; 20 lbs. muriate of potash.

This would be enough for 100 plots 5 ft. x 10 ft., and would cost between three and four dollars. In fairly rich soil or where some stable manure is used, less than this of commercial fertilizer would do. An occasional crop of clover spaded or plowed down would also be found useful in enriching the soil.

IV. DETAILS OF WORK.

Notes on Planting.—Teachers with limited experience in gardening will find some difficulty at first in making a selection from seed catalogues for the school garden. To allow the pupils as much freedom as possible in choosing their own plants and at the same time safeguard them from possible failure and consequent disappointment may become one of the most difficult school garden problems. A few general rules and suggestions will prove helpful. Beginners should choose the more familiar plants, especially those that do not require more than ordinary treatment. Young pupils should plant seeds that are easily handled, quick to germinate, and sure to grow under ordinary conditions. These seeds the teacher should select. Pupils should not attempt to grow too many varieties in one season. A pupil might be allowed to cultivate only one variety if he so wished, but the tendency is to err in the other direction. After the first year the pupils should be encouraged to try at least one new variety of flower or vegetable each year and thereby gain a wide and practical knowledge of varieties. They might, however, be allowed to cultivate the same varieties year after year if they so desired. The older pupils should choose part of their varieties from the list of plants that require to be started early in hot-beds or window-boxes, so that they may become familiar with the work of transplanting.

Plots are planted in April or May.

Plants that grow very tall (corn, sunflowers, etc.) should not be put in small individual plots, as they tend to interfere with the supply of light to low-growing plants near them. Vines also (squash, cucumbers, etc.) should be grown only in large plots, as they obstruct the paths and interfere with plants in neighbouring plots. Different varieties of corn should not be planted side by side, as the wind will carry the pollen of one variety to the pistils of the other if planted near together, and mixed varieties will result. When planting in rows, the rows should run north and south, as the plants will get most sunlight evenly distributed when so planted. If the rows are short and must run east and west, the tall-growing plants should be planted at the north side of the plot.

In choosing flower seeds the mixed varieties are preferable for beginners, so that they may become familiar with the many shades. Later on single colour varieties may be of advantage and colour schemes in planting should be encouraged amongst older and more experienced pupils. Flower designs also afford scope for the imagination and tend to encourage originality. Only low-growing plants of fairly compact habit should be chosen for flower designs or border work. Mass effects which result from growing only one variety of flower in a plot, add to the attractiveness of the garden. Some flowers, like the poppy, verbena, portulaca, or petunia, make a fine display when so grown. Every school garden should have a visitors' plot of fine flowers from which interested visitors would feel at liberty to "take one." The picking of flowers or vegetables from plots by persons other than the owners of those plots should be strictly prohibited.

Ornamental shrubs should be planted along the sides and in the corners of the grounds—never in the garden nor out in the open grounds where they would interfere with the playing of outdoor games. The same may be said of shade trees. For lists of suitable shrubs and trees see Departmental pamphlet on School Grounds.

Each pupil should know what he is to plant before planting day comes, and should submit a plan of his plot for the teacher's approval or for rearrangement. To avoid confusion in the garden, not more than a dozen pupils should be engaged in planting at one time. If the flower or vegetable seeds are to be put in in rows, the rows should be kept in perfect line across the garden, and if possible at a uniform distance apart. A garden line and a rule are needed for this purpose. A twelve-inch board about 6 ft. long will be found very useful in planting. It can be used as a straight-edge in making the drill for the seed, is convenient to stand on when sowing the seed, and, lastly, for firming the soil over the seeds when planted. It is very convenient to have the rake-handles marked off in feet and inches.

When the plots are ready and the drills made for the seed the teacher should place in the left hand of each pupil just enough seed to plant the row, giving at the same time a word of instruction as to how thick the seeds should be planted and how much earth should be put over them. Care should be exercised to prevent needless waste of seed. The seed should be taken between the thumb and index finger of the right hand and spread thinly and evenly along. The finer and weaker the seeds the less covering they should have. If the soil is very dry it should be thoroughly watered the day before the planting is to be done. This is a much better practice than to sow seeds, and especially fine seeds, in a dry seed bed and then to water with the sprinkling can. The latter practice invariably causes a hard crust to form over the top, through which the young plants come up with difficulty, if at all. Free access of air is also prevented and the moisture necessary for growth is allowed to escape.

Plots will be at their best in August or September.

From one to three weeks after seeds have been planted and when danger of frost is past, the transplanting from hot-beds or cold-frames may be done. If possible it should be done on a moist or cloudy day, otherwise it will be necessary to shade the plants with papers or shingles for a few days and to water them frequently. Water from a well should be allowed to stand in a tank or barrel for a few hours before being used on garden plants. The holes for the plants may be made with a transplanting trowel, or, if the plants are very small, with a sharpened stick. Before the plants are lifted they should be thoroughly watered to prevent the breaking of the delicate rootlets. They should be placed in the holes, being watered if the soil is very dry; and the earth then firmly pressed around their roots. When set, they should be slightly deeper in the soil than before transplanting.

School Time Required for Gardening.—It is difficult to define the time required for gardening at a school. Local conditions differ greatly. In some cases considerable work will be required on the ground before it is made into a garden. The laying out of the plots and paths at first might take the boys of the fourth and fifth forms a whole afternoon. To prepare the ground for planting, half an afternoon will be required, and to plant the seed another half afternoon will be required. Afterwards one-half hour a week should be sufficient for weeding, thinning, and cultivating. In the fall a half afternoon will be needed for clearing the plots, and another for digging the plots in preparation for winter.

Care of the Garden after Planting.—The prevention rather than the eradication of weeds should be aimed at. If cultivation is carried on regularly and systematically from the first, the weeds will all be destroyed in the germinating stage and will give no further trouble. Mere weed killing is, however, not the greatest value to be gained by cultivation; for if the soil is thoroughly stirred around the roots of the plants a couple of times every week, the necessary supply of air in the soil for rapid growth will be ensured. In many cases the top soil forms into a hard crust, especially after a heavy rainfall, and in this hard soil are many little channels through which moisture escapes into the air by evaporation. This soil should be finely pulverized to a depth of two or three inches, thus forming an earth mulch which prevents the rapid escape of moisture from the soil. If mulching and cultivation are thus carefully attended to, the difficult problems connected with the weeding and watering of a garden are incidentally solved. The garden rake should supersede the sprinkling can under ordinary circumstances. Of course it is necessary to water plants after transplanting, and there are certain soils that need watering occasionally during a dry season, but such cases are not common. If artificial watering is needed it should be done in the evening and a plentiful supply should be given. Merely wetting the surface soil encourages shallow rooting and is injurious to the plants.

Care should be taken not to have the plants much crowded in the rows or the rows very close together. The ideal condition would be to have the plants so far apart that they would completely cover the ground without crowding when full grown. When the plants have reached this stage of development, if cultivation has been thoroughly and carefully done there will be no further danger from weeds, as weeds will not grow in such deep shade. It is sometimes a difficult matter to get pupils to thin out the rows of flowers or vegetables sufficiently. It seems to them like a deliberate waste of plants, but the thinning must be insisted upon. It should be begun when the plants are not more than two inches high and, preferably, when the soil is damp after rain.

The detection and the treatment of garden pests is a matter of increasing importance to all gardeners, but it is especially important in connection with school gardening. Nature study with insects can be carried on to greatest advantage in a school garden. An insect at work in its own natural environment is immensely more interesting to the child and is of far greater importance from the Nature Study point of view than an insect impaled upon a pin in a glass-covered box. The life history of some of the common garden insects can be studied, their feeding habits noted, and suitable insecticides used on the injurious ones. Fungous diseases of plants, such as the potato blight and the tomato rot, should also be studied and the pupils made familiar with the nature and use of such fungicides as Bordeaux Mixture.

A Hundred Plots, Rural School Gardens, Richmond.

The blooming period of flowers can be prolonged by keeping the flowers closely picked. Seed should never be allowed to ripen unless wanted for subsequent planting, in which case only that from the finest blooms should be preserved. Such selection of seed can best be done by tying strings or labels around the flower stems before the bloom is gone.

Constant care should be exercised in keeping the garden tools in their allotted places. They should never be left out in the garden. All garden refuse, such as weeds, dead plants, etc., should be kept out of the paths and placed in a refuse or compost heap in the least conspicuous place in the garden. When decomposed it produces a valuable humus for potting plants or for use in flower borders. Early in October the plots should all be cleaned off, spaded, and left in readiness for planting operations the following spring.

The produce from the individual plots should become the property of the respective owners and should be removed by them. The produce from each class plot should be divided amongst the members of the class interested, and that from general experimental plots might be sold by the pupils, the salesman in each case to get a commission of say 10 per cent. on his sales, and the balance to be placed in a general garden fund and used to defray expenses or to purchase tools, pictures, apparatus, etc.

Plots are cleared in October.

The pupils should be encouraged to give liberally of their flowers to churches and charitable institutions, and every sick-room in the community should be brightened continually by flower bouquets from the school garden. The surplus of plants or the seeds of good varieties should be distributed amongst the people of the section.

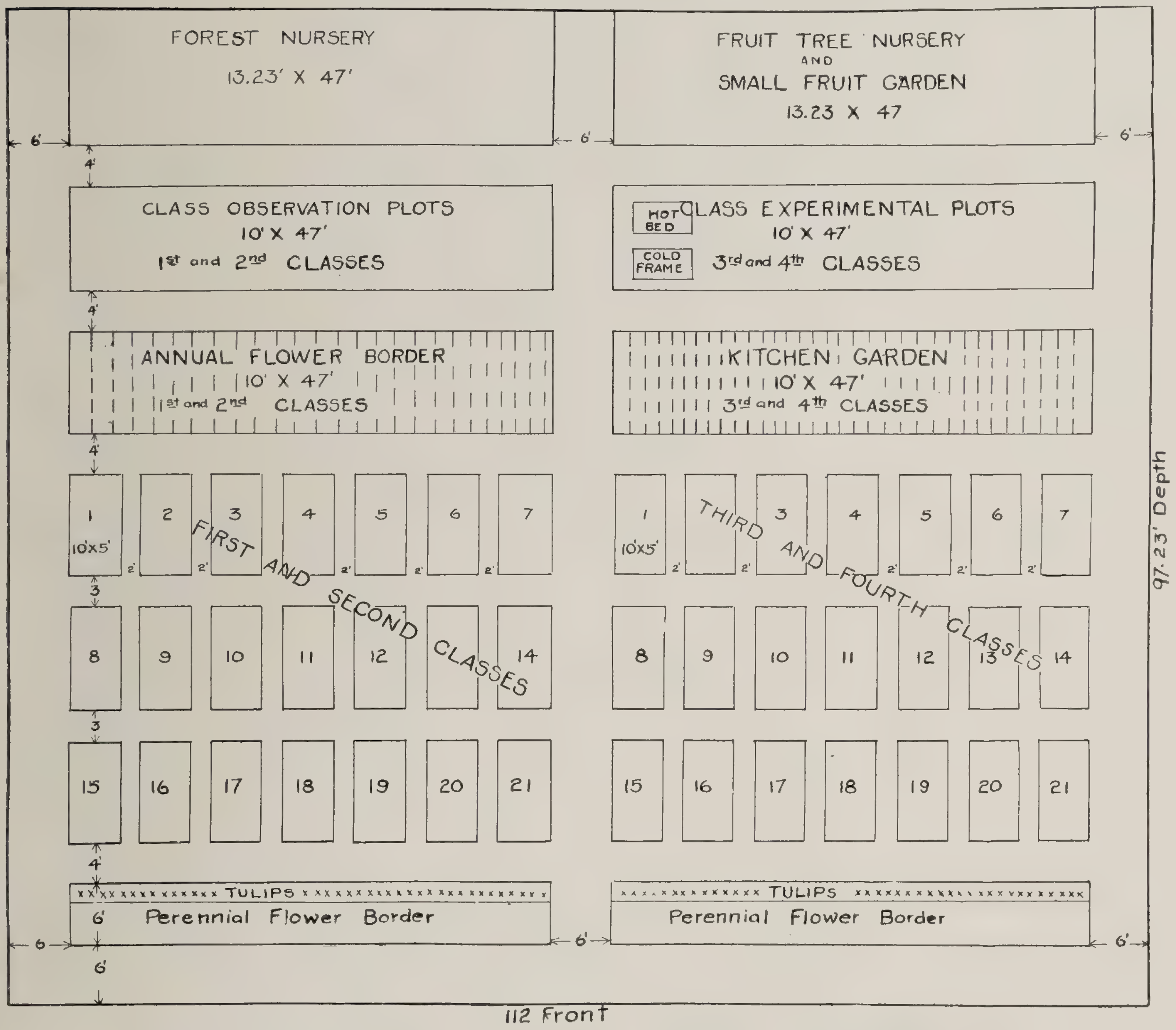
Care During Summer Holidays.—Much depends upon how the work has been done before the holidays begin. If all of the above suggestions regarding cultivation and care are faithfully carried out, when the summer holidays arrive the weeds will have been pretty well conquered for the season and the garden plants well advanced. If, however, the best results are to be obtained some attention is necessary during the summer holidays and the pupils should be given to understand at the beginning of the season that they alone are responsible for the care of the plots which have been assigned them. It should be understood also that they will visit their plots once every week during the holidays, or, if absent, they will make arrangements with other pupils to do so. If the work has been conducted in such a way that the interest has been keen throughout the term, the pupils will cheerfully give their plots this necessary care. If the teacher is a resident of the section, he will be able to meet the pupils at the garden occasionally after school closes in June. In the case of large gardens it may be found necessary to arrange with one or two of the older boys or with some suitable man to do extra work in the garden, the cost to be paid by the School Board from such funds as may be available for garden purposes. General care of the garden rather than care of individual plots should be provided for in this way.

Plots are left in good shape for the Holidays.

Correlation.—The extent to which school garden work may be correlated with the ordinary school studies depends largely on the resourcefulness of the teacher. He should take advantage of the garden and of the garden exercises in adding freshness and in giving a practical bearing to subjects which are intrinsically uninteresting to children. Garden work and garden observation afford interesting subject matter for exercises in drawing and composition—interesting because so closely associated with the pupils' own experiences and life interests. Many of our foremost authors and nature poets have idealized the plants of the garden as well as those of the wildwood, so that children's gardening experiences and their own first hand knowledge of plant and animal life, may serve to bring them into a fuller enjoyment of the literature of nature. Many practical problems in arithmetic are suggested, and even demanded, in connection with school gardening. The keeping of garden accounts, for example, may be made a valuable training in bookkeeping and in commercial arithmetic. Weights, measures, values, and mensuration are all more or less involved in school gardening. For more advanced classes the study of botany with garden plants and of zoölogy with garden insects, etc., can be carried on to very great advantage.

V. SUGGESTIONS FOR GARDEN PLANS.

The following plan includes all the different features of School Gardening. There are individual plots, each 5 ft. by 10 ft., for 42 pupils; and by alloting two children of the first and second classes to a plot, about 65 pupils may be accommodated. Further, by reducing the plots to 4 ft. by 10 ft., a garden of this area will furnish 48 individual plots, and by the arrangement of two children working one plot, about 75 pupils may be accommodated.

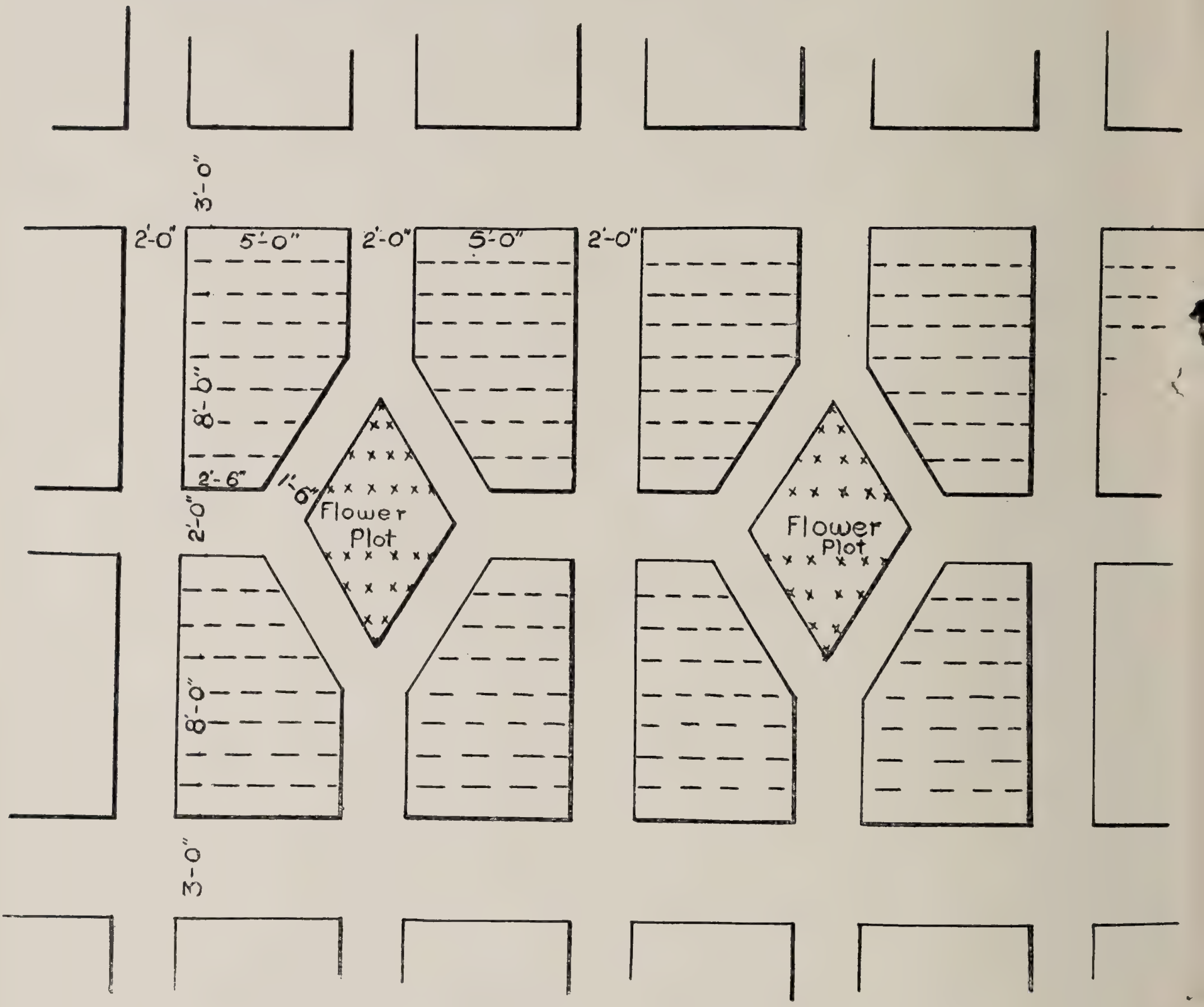


SUGGESTED PLAN FOR SCHOOL GARDEN
Area:-$\frac{1}{4}$ acre = 10890 Square Feet
Dimensions:-112' X 97.23'

For the average one-teacher country school a garden of half the area used in the above plan will likely be quite sufficient; one-eighth of an acre (5,445 square feet) would permit all phases of the work to be carried out.

A little less than one-half the area is given to individual gardens for the children. The remainder is allotted to (1) a Perennial Flower Border, (2) a Kitchen Garden, (3) an Annual Flower Border, (4) Class Observation Plots, (5) Class Experimental Plots, (6) a Forest Nursery, (7) a Fruit Tree Nursery.

In most cases it will not be advisable to undertake all the different phases of the work the first year. For a commencement the children's individual plots with one or two observation and experimental plots will probably be found sufficient. The second year a perennial border might be added, and so forth.



GROUP SYSTEM FOR CHILDREN'S PLOTS.

Children's Individual Plots.—The garden plan on p. 12 shows a plot 5 ft. by 10 ft. as a unit. For pupils in primary classes these might be divided by a narrow path allowing a plot 4 ft. by 5 ft. for each. Pupils in the senior classes may be able to manage two of the larger plots. In some gardens four plots may be grouped into one section as is shown in the above plan. The arrangement brings four boys or four girls into friendly partnership with one another, and friendly rivalry with another group of pupils. It allows, too, for a common flower bed in the centre instead of mixing flowers and vegetables in each bed. It permits, moreover, an opportunity for variety of treatment amongst the pupils, and for care in the summer holidays lends itself to a co-operative arrangement amongst the pupils by which they may take turns in caring for a neighbour's property. It is advisable to restrict the number of vegetables or flowers grown in the children's plots. One kind of vegetable and one kind of flower may be found sufficient for the children of the primary classes. In the third and fourth forms, two or three kinds of each may be allowed.

(1) **The Perennial Border.**—The perennial border should contain the common flowering perennials grown in the neighbourhood. It may be started with contributions of roots from local gardens. Afterwards when the plants become crowded and require thinning, the border will furnish plants for the gardens at the children's homes. The following list contains the most desirable kinds and indicates the method of propagation :—

Aquilegia chrysantha (Golden Columbine)—Seeds.
Aquilegia cœrulea (Rocky Mountain Blue Columbine)—Seeds.
Bellis Perennis (English Daisy)—Seeds.
Calliopsis lanceolata—Seeds.
Campanula carpatica (Carpathian Bells)—Seeds.
Campanula media (Canterbury Bells)—Seeds.
Convallaria majalis (Lily of the Valley)—Division.
Crocus in variety—Bulbs.
Delphinium hybridum (Larkspur)—Seeds.
Dianthus barbatus (Sweet William)—Seeds.
Dielytra spectabilis (Bleeding Heart)—Division.
Digitalis (Foxglove)—Seeds.
Gaillardia grandiflora—Seeds.
Hollyhock—Seeds.
Iris Germanica (German Iris)—Division.
Iris Kœmpferi (Japanese Iris)—Division.
Lychnis chalcedonica—Seeds.
Myosotis (Forget-Me-Not)—Seeds and division.
Narcissus in variety—Bulbs.
Paconia (Pæony)—Roots.
Papaver nudicaule (Iceland Poppy)—Seeds.
Papaver orientale (Oriental Poppy)—Seeds.
Phlox, hybrid perennials in variety—Division.
Rudbeckia lanceolata (Golden Glow)—Division.
Tulips in variety—Bulbs.
Valeriana officinalis (Garden Heliotrope)—Division.
Vinca minor (Periwinkle or Trailing Myrtle)—Plants.

The tulips may be put in as a back row of the border as indicated in the cut of the garden or scattered in groups throughout the border.

Perennials started from seed in August, protected through the winter by a light covering of leaves or straw and transplanted to permanent positions in the spring will bloom that same year.

(2) **The Kitchen Garden.**—Where Domestic Science is taught in the school the Kitchen Garden may be put in charge of the girls in the senior classes; in it they can grow such vegetables or herbs as are needed in their cooking classes. If not required for such a purpose, it may be taken over by the teacher himself, the caretaker of the school, or anyone else who takes charge of the garden in the summer holidays. The vegetables selected should be those which can not well be grown in the

small individual plots of the children and which at the same time are necessary to represent properly the kinds that may be grown in a home garden. Such vegetables as asparagus, cabbage, cauliflower, celery, citron, kohl rabi, rhubarb, salsify, tomatoes and pumpkin, and such herbs as sage, summer savory and thyme might be included. They will offer many opportunities for botanical and insect studies besides suggesting lines of gardening for home gardens.

(3) **The Annual Flower Border.**—Like the kitchen garden the Annual Flower Border supplements children's individual plots. It might be put in charge of a group of pupils selected from the different classes or given into the hands of the teacher or caretaker. In it may be raised such annuals as do not lend themselves to growing in the small plots.

Such flowers as sweet peas, morning glory, sun flower, castor oil plant, climbing nasturtium, gourds, gladioli, and phlox Drummondi will be suitable for this part of the garden.

(4) **Class Observation Plots.**—The object sought in the Observation Plots is to provide opportunities for observations on plants which lend themselves better to comparison than those open to the pupils in their own plots. The quarter acre garden shown in the plan on p. 12 provides for seven such plots, each ten feet long and five feet wide. While one plot may be sufficient for each of the lower classes, the older pupils in the higher classes may easily care for two or three.

The following list suggests suitable subjects :—

(1) Flower Plot.—Comparison of dwarf and climbing nasturtiums

(2) Vegetable Plot.—Comparison of the different kinds of onions and the production of seed or "tops."

(3) Forestry Plot.—Comparison of different kinds of maples as grown from seeds collected in the neighbourhood.

(4) Agriculture Plot.—Comparison of the seven species of wheat—common, macaroni, Egyptian, Polish, spelt, emmer, and one-rowed.

The above four plots are for the first, second, third and fourth forms respectively as outlined for use of the schools in 1910 by the Schools' Section of the Experimental Union (O.A.C., Guelph).

For this work there is a great variety to select from. The interests of the locality will determine the selection to some extent. Following out the idea of having flowers, vegetables, trees and farm crops for the first, second, third and fourth classes respectively, the following may be taken up in different years :

First Form.

(5) Comparisons of Common Flowers that have Different Colors.—*e.g.*, a plot of mixed petunias one year, balsams another year, phlox Drummondi another, etc.

Second Form.

(6) Comparison of Beans.—Kidney beans of different kinds, dwarf and climbing, wax and green; Lima beans, Windsor beans, scarlet runner.

(7) Comparison of Vegetables of Goosefoot Family.—Beets, sugar beets, mangel wurzel, Swiss chard, spinach.

Third Form.

(8) Comparisons of Forest Trees.—Growing seedlings of beech, basswood, maples, butternut, etc.

(9) Comparison of Fruit Trees.—Growing seedlings of apples, plums, peaches and cherries.

Fourth Form.

(10) Comparison of Common Grains.—Wheat, oats, barley, rye.

(11) Comparison of Common Grasses.—Timothy, orchard grass, red top, Canadian blue grass.

(12) Comparison of Clovers.—Red, Alsike, White.

(5) Class Experimental Plots.—In this part of the garden work, the solution of simple problems is attempted. More than simply observation of phenomena is required here; the plants are made to answer questions regarding their growth. The pupil controls certain conditions in regard to selecting the seed, treating the soil, or planting the seed. It differs from experimenting in chemistry or physics in a laboratory in that living plants are under investigation out-of-doors.

Naturally this work will be largely in the hands of the senior pupils; should there be a fifth class in the school it will be found suitable for them. In the garden plan on p. 12 the plots are 10 ft. by 5 ft. In some cases it may be advisable to make them a definite fraction of an acre as 10 ft. 5 in. square (1-400 of an acre) or 10 ft. 5 in. by 20 ft. 10 in. (1-200 of an acre). The following experiments may be found suitable. For the first year's work one experiment may be sufficient.

(1) To Determine the Best Depth of Planting.—Divide the plot into four parts and in each part sow one hundred grains of wheat—one-half, one, two and three inches deep respectively.

(2) To Compare the Growths of Soaked and Unsoaked Seed.—Divide the plot into two parts, and in one plant unsoaked beans; in the other beans that have been soaked before planting.

(3) To Determine how Climbing Plants Climb.—Divide the plot into small sections and separately plant seeds of such climbers as pole bean, scarlet runner, hops, morning glory, wild cucumber, climbing nasturtium, cobea, cypress vine. Put up poles for the plants to cling to.

(4) To Compare the Growth of Sprayed and Unsprayed Potatoes.—Use two separate plots for this; plant in each the same number and kind of potato. Spray one plot with Bordeaux Mixture regularly throughout the season; on the other plot leave the plants unsprayed. At the end of the season, weigh and compare the products.

(6) To find the Effects of Commercial Fertilizer (Sodium Nitrate) in Growing Cabbage.—Use two plots for this. In each plant the same number and kinds of young cabbage plants In one plot treat the plants with small and repeated applications of Sodium Nitrate.

(7) To find the Value of Clover in a Crop Rotation.—Plant potatoes or a grain on a plot that has had clover grown on it the previous year, and compare it with a similar crop on another plot that has not had a manuring with clover.

(8) To Compare the Yields from Selected Seeds.—Use three plots for this. Divide a sample of seed wheat into three grades. In the first plot plant a certain weight of large selected plump wheat; on the second,

the same weight of small plump grains, and in the third the same weight of shrunken grain. Compare the growths and estimate the weight and quality of grain yielded in each plot.

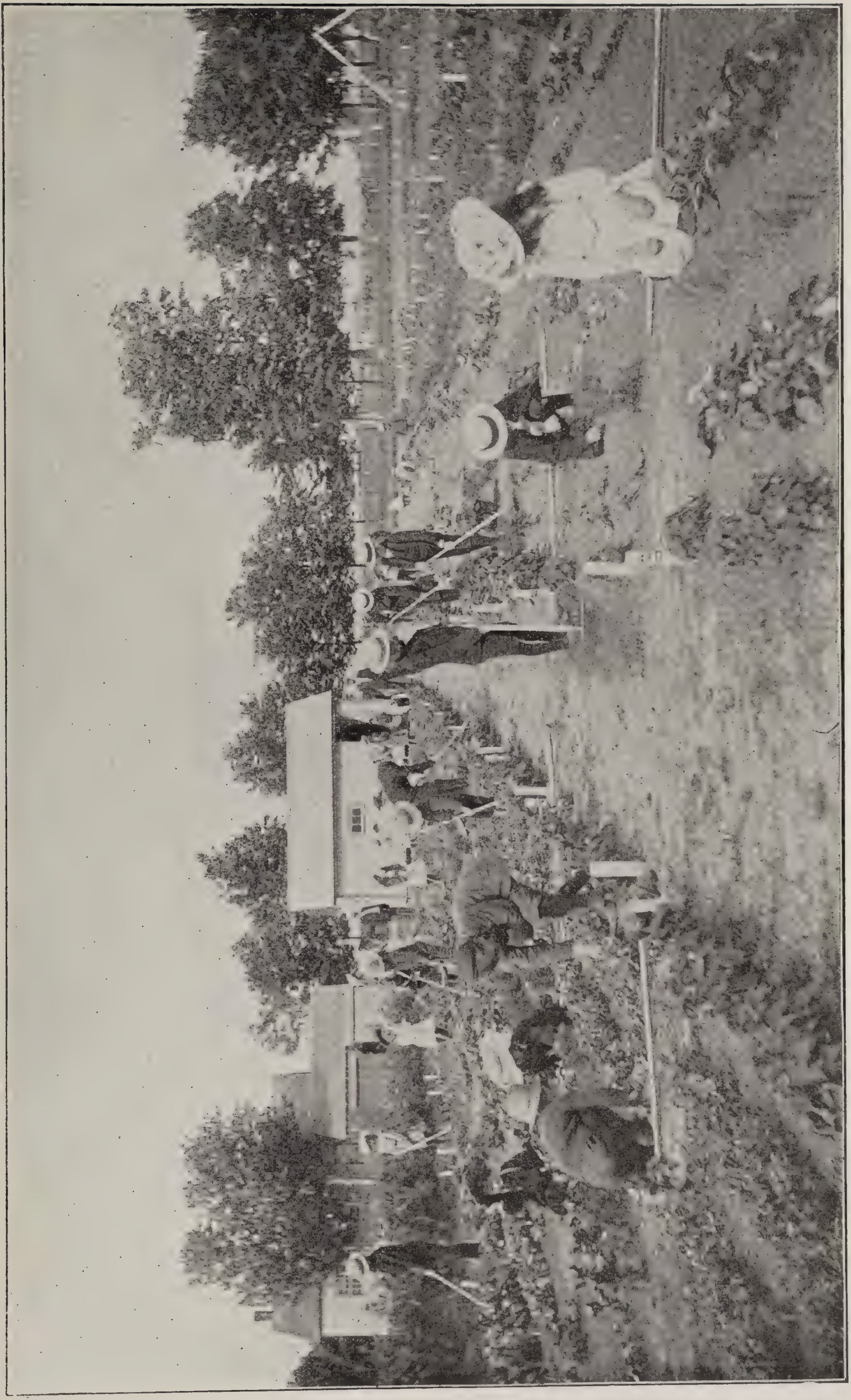
(6) **Forest Nursery.**—This part of the garden may be the means of arousing in the neighbourhood an interest in tree planting. It may moreover grow into a small distributing centre for the homes of the neighbourhood; it will not take very long to raise all the trees that it is advisable to plant out on the school grounds; after that the products of the nursery should be given to the children to plant out at home. The work will require the close oversight of the teacher, but senior pupils will be able to take a considerable share in the work.

Pupils should be encouraged to bring tree seeds or young tree seedlings from the woods. In the spring, much material may be found under the trees along the roadsides in the shape of sprouting maples, beeches, etc. In the fall, nuts may be planted directly into rows in the garden. The following table indicates the possibilities of the work.

Species.	Time to collect seeds.	Time to sow seeds.	Storage.	Height of one year old seedlings.
White pine	Last of August, September.	Spring.	Dry and cold.	2½—3½ inches.
Tamarack	September.	"	"	2—3 "
Black spruce	Sept. and Oct.	....	....	1½—2½ "
White spruce	"	Spring.	Dry and cold.	1½—2½ "
Norway spruce	"	"	"	1½—2½ "
Hemlock	"	"	"	2—3½ "
Balsam fir	"	"	"	
White cedar	"	"	"	1½—2½ "
Willows and poplars	July.	Sow at once.	....	
Basswood	October.	Spring or fall.	Bury in sand.	6—12 "
Black walnut	Sept. and Oct.	"	"	10—14 "
Butternut	"	"	"	10—14 "
Hickory	"	"	"	6—9 "
Chestnut	Oct. and Nov.	"	"	
Beech	"	"	"	
Oaks	Sept. and Oct.	"	"	5—9 "
Elms	May and June.	Sow at once.	....	5—10+ "
Sugar maple	October.	Spring or fall.	Bury in sand.	6—12 "
Manitoba maple	Oct. and Nov.	"	"	
Silver maple	May and June.	Sow at once.	....	12—20 "
Red maple	"	"	....	6—10 "
Ashes	October.	Spring or fall.	Bury in sand.	
Black cherry	August.	"	Dry & cold best.	8—14 "
Locusts	October.	"	Bury in sand.	Black 18—20+ Honey 6—14
Sycamore	Oct. and Nov.	"	"	
Tulip-tree	October.	"	"	

The problem of reforestation will undoubtedly need to be considered seriously in the Province before very long. The Forest Nursery in the school gardens will partly solve the problem.

☞ Teachers desiring to start a plot in their school gardens may obtain a free supply of seedling trees from the Forestry Department by making application through the Schools' Section of the Experimental Union,



In the Middle of the Lesson—Rural School Gardens, Bowesville.

Ontario Agricultural College, Guelph. All applications should be made not later than March 1st. After that date, applications cannot be considered, as early arrangements have to be made for lifting and packing the trees. It should be clearly understood that these seedlings are for EDUCATIONAL PURPOSES IN SCHOOL GARDENS. They will not be sent to schools where gardens are not established. The plants are quite small and will require care in the School Forest Nursery for a few years before being planted out permanently. At schools where there are already sufficient trees about the grounds the trees may be distributed amongst the pupils for planting at home. But it should be held in mind that nearly any school can grow these plants for itself by taking a care to collect seed, and to plant it in a well protected nursery. Arrangements may be made by the Schools' Section to send out the seed of such trees as do not grow locally, to such schools as have started a Forest Nursery.

(7) **Fruit Tree Nursery and Small Fruit Garden.**—This section ot the garden work will differ from the Forest Nursery in that it deals with trees that are grown for their fruit. In a fruit growing district, the work will be of especial interest. Like the Forest Nursery, it will require the care of the teacher and senior pupils. In some cases, interested trustees or parents may undertake its supervision and direction.

The work does not require so large a plot of ground as that shown in the plan on p. 12—13.23 ft. by 47 ft. Part might be planted out in shrubbery. A great deal could be done on two or three small garden plots. Apple, peach, pear, plum and cherry seeds could be sprouted and cuttings of gooseberries, currants, grapes, and raspberries propagated for demonstration to the classes. The material grown should be distributed to the children afterwards. This will be an inducement for them to share in the interest and work.

VI. SUGGESTIONS FOR EQUIPMENT.

(1) **Garden Shed.** —Provision will be required for storing tools and carrying on work not suitable to the classroom, such as analysis of soils, selecting seeds, making labels, and potting plants. It will be well, however, not to build a special structure until it is learned by experience what is required. At the commencement of the work all that may be needed will be racks for holding the rakes and hoes, and these may be arranged in the school without taking up much room. If there is a well lighted basement, it may be found adequate, or the wood shed may be used for the purpose.

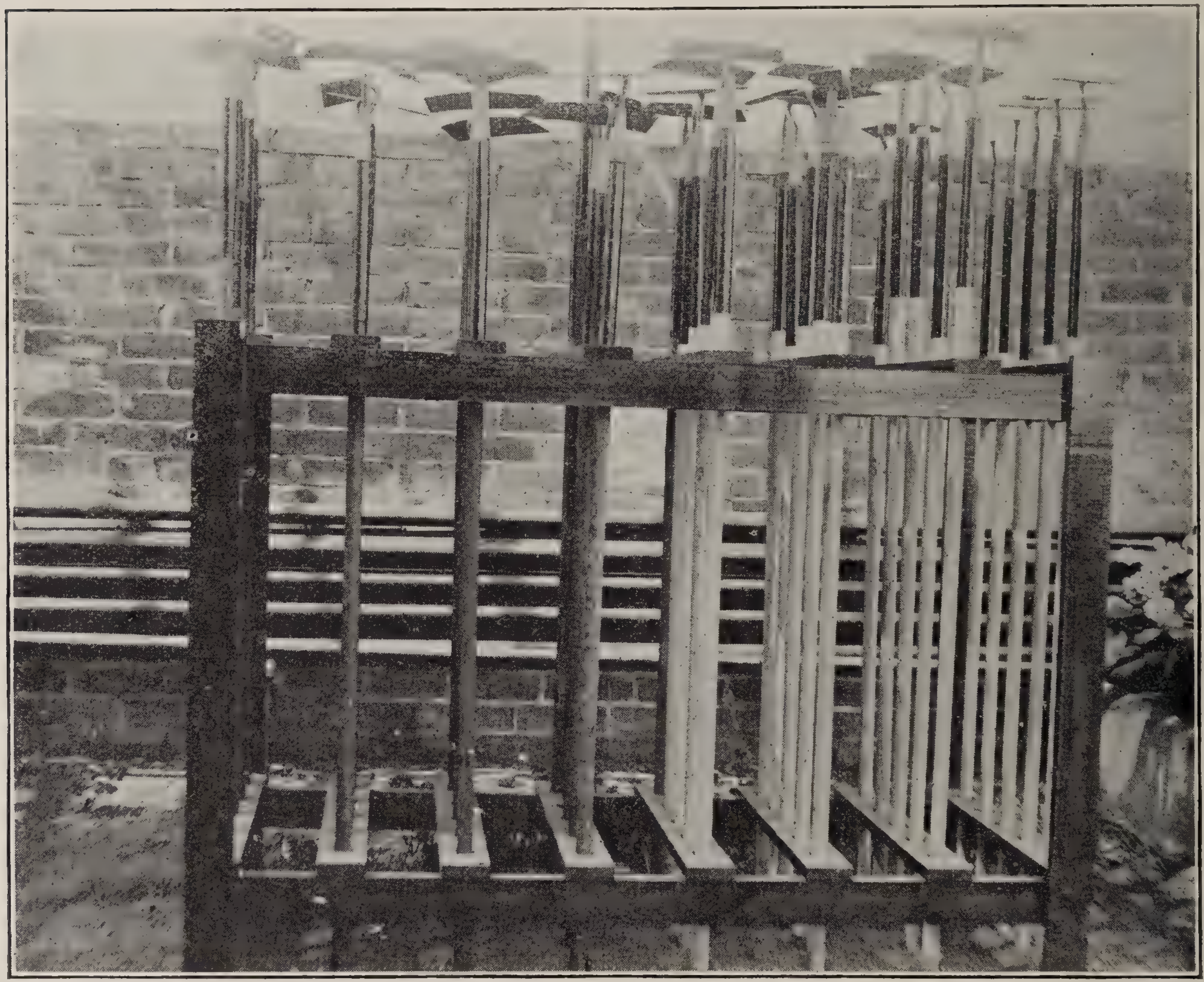
When a new school is built, the requirements may be well met by having a small room built as a projection from the south side This should be separated from the school room by sliding doors, and well lighted so that the work in plant propagation can be carried on in it The school work bench and tools will be kept here, and all the manual training exercises carried on with them. (See pamphlet of plans for Rural Schools).

If it is found that a special shed is required this should be about 10 ft. by 20 ft. It should be placed conveniently to both the school and the garden, and its south side provided with generous window space.

(2) **Garden Tools.**—For each two pupils in average attendance a rake, hoe, and hand weeder should be provided. For each six pupils, there should be a spade or a digging fork. The tools should be numbered and each pupil made responsible for keeping them clean. A rack should be provided and the children trained to put them away in their proper places. While the work is in an experimental stage, arrangements may be made with the pupils to borrow hoes and rakes from home.

For a school of thirty pupils the following price list will give the approximate cost:—

15	Six-inch garden hoes, at $4 50 doz	$5 62
15	Ten-inch steel rakes, at $5.40 doz	6 75
15	Claw hand weeders, $1.50 doz	1 87
2	Short handled shovels, at 85c. each	1 70
2	Short handled spades, at 85c. each	1 70
2	Short handled digging forks, at 85c. each	1 70
3	Transplanting trowels	50
1	100 foot garden line and reel	1 00
1	66 foot tape line	1 25
1	Wheel Barrow	3 50
1	Lawn Mower	5 00
	Total	$30 59

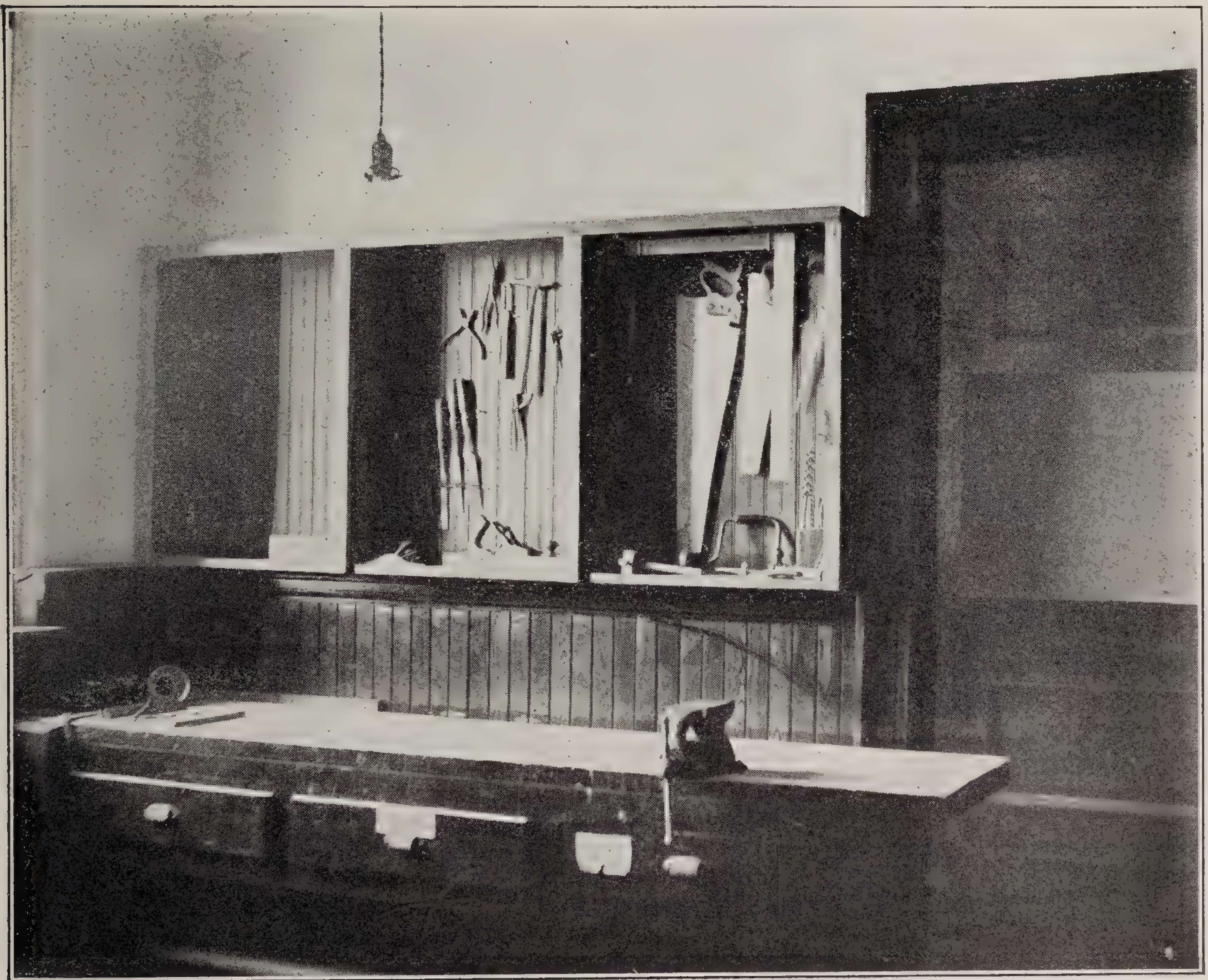


A Rack for the Garden Tools.

(3) **Tools and Work Bench.**—When the garden is well established and a suitable place provided for the garden equipment as suggested under (1) above, a school kit of tools and work bench may be profitably arranged for.

The following price list suggests equipment and its cost :—

Bench and Vises	$10 00
Saws.—Rip Saw, $1.40; Panel Saw, $1.00	2 40
Chisels.—¾ inch Bevelled Edge Firmer, 30c.; Cold Chisel, 5c.	35
Planes.—Block or Hand Plane, 65c.; Spokeshave, 30c.	95
Files.—Three-cornered, 10c.; 8-in. Flat File, 15c.	25
Hammers.—Claw Hammer, 50c.; Rivetting Hammer, 50c.; Mallet, 35c.	1 35
Brace and Bits, $2.00; *Pliers*, 50c.	2 50
Tape Measure	1 00
Compasses, 40c.; *Marking Guage*, 15c.; *Scratch Awl*, 10c.	65
Framing Square, 50c.; *Try Square*, 35c.	85
Monkey Wrench, 45c.; *Screw Driver*, 20c.	65
Oil Can, 5c.; *Oil Stone*, 40c.; *Glass Cutter*, 15c.	60
Total	$21 55



Tools and Work-bench for a Rural School.

(4) **Seed Supplies.**—Good seed should be secured for the garden. During the winter, the children should procure catalogues from the seed

houses, help in making a selection, and share in the correspondence regarding purchases. When the seed comes, germination tests should be made by the classes. To secure the supplies against loss or injury, they should be kept in tins or glass jars. Common grains required for experimental or observation plots may be provided by the pupils.

The following list suggests the supplies needed for thirty pupils :

Vegetable Seeds.

1 peck improved variety of potatoes; 1 lb. beans, 2 varieties; 1 lb. sugar corn, 2 varieties; ¼ lb. beets, 2 varieties; 1 oz. carrots, 2 varieties; ½ oz. seed onion, 2 varieties; 2 oz. radish, 2 varieties; 1 oz. lettuce, 2 varieties; 1 oz. parsnip; 1 oz. turnip; 1 pkt. cucumber; 1 pkt. cress; 1 pkt. kale; 1 pkt. kohl rabi; 1 pkt. summer savory; 1 pkt. sage.

The following to be started in a hot bed or window box : 1 pkt. cauliflower; 1 pkt. Brussels sprouts; 1 pkt. celery; 3 pkts. cabbage, 3 varieties; 3 pkts. tomato, 3 varieties. Estimated cost.........$2 00.

Flowering Annuals.

To be started indoors or in hot bed : 3 pkts. aster, mixed or 3 named varieties; 2 pkts. balsams, mixed; 2 pkts. dianthus (pinks); 1 pkt. pansy; 1 pkt. petunia; 1 pkt. portulaca; 2 pkts. phlox Drummondi grandiflora; 1 pkt. Ricinus (Castor bean); 1 pkt. scarlet sage; 1 pkt. salpiglossis; 1 pkt. sweet scabious; 1 pkt. ten-week stocks; 1 pkt. verbena.

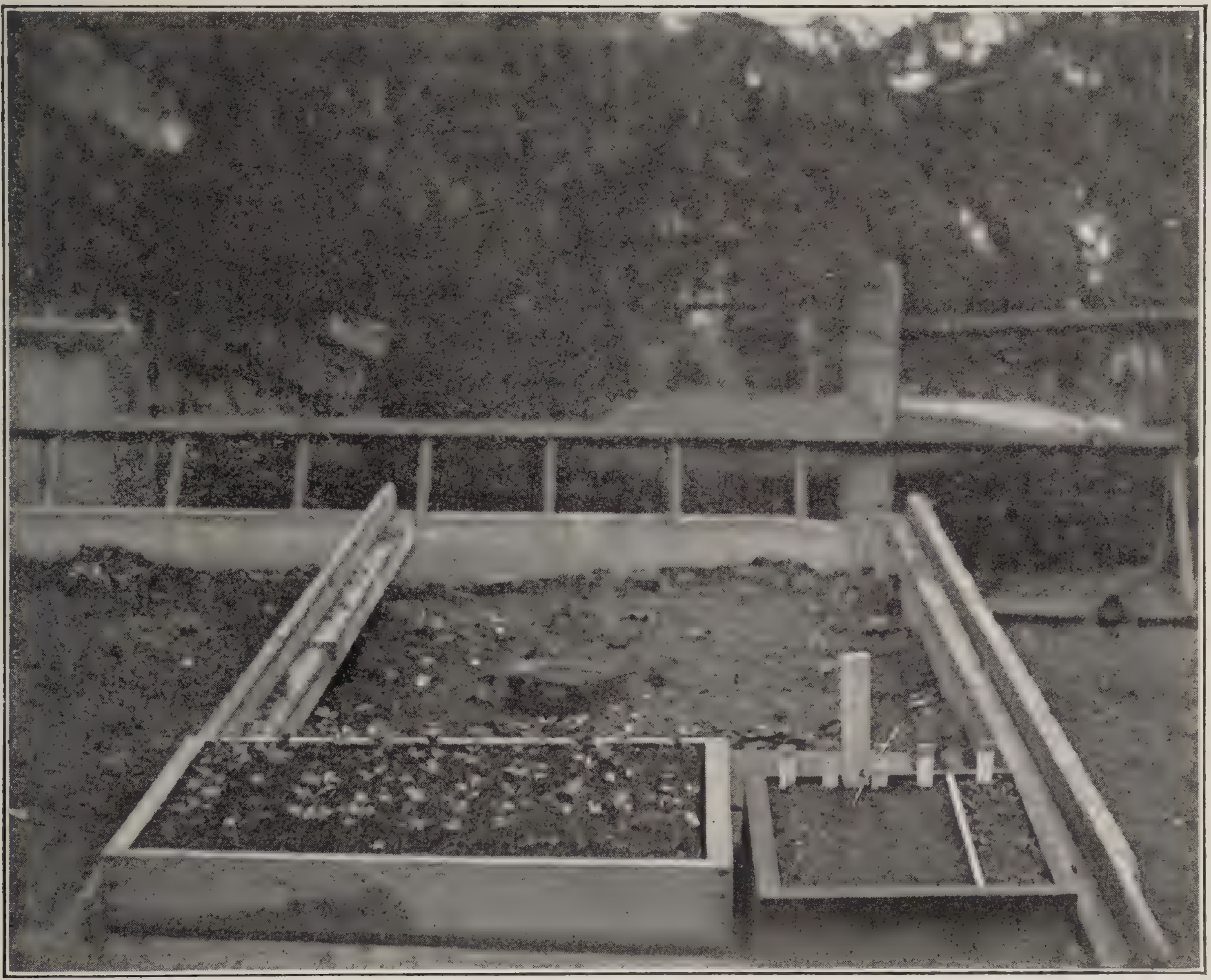
For open planting: ½ oz. sweet alyssum; ½ oz. candytuft; ½ oz. mignonette; 2 pkts. dwarf nasturtium; 2 pkts. Eschscholtzia (California poppy); 2 pkts; Shirley poppy; 1 pkt. double mixed poppy; 1 pkt. tall nasturtium; 1 pkt. mixed sweet peas; 1 pkt. double hollyhock (biennial); 1 pkt. Russian sunflower. Estimated cost $2 00

☞ If it is thought desirable to have the children purchase their own seeds, arrangements may be made with the Schools' Section of the Experimental Union, O.A.C., Guelph. This organization does not, however, distribute all kinds of seeds. In 1909, the allotment was restricted to the following, and a charge of one cent a packet was made.

Class	**Flowers**	**Vegetables**
JUNIOR FIRST CLASS	Nasturtium	Lettuce
SENIOR FIRST CLASS	Sweet Peas	Radish
JUNIOR SECOND CLASS	Calendula	Beets
SENIOR SECOND CLASS	Corn Flower	Spinach
JUNIOR THIRD CLASS	Petunia	Beans
SENIOR THIRD CLASS	China Pinks	Carrots
JUNIOR FOURTH CLASS	Verbena	Onions
SENIOR FOURTH CLASS	Asters	Sweet Corn

The selection may be found suggestive as an allotment for the garden work of the different classes.

(**5**) **Hot Bed and Cold Frame.**—In the equipment of a complete School garden, these might well have a place. In them plants required for early planting in the school garden could be brought on. Any surplus could be sold in the neighbourhood or distributed free. The hot beds need not be large. Two of the double windows used on the school might be used for the glass coverings. Instructions for their preparation and care may be had in garden books or catalogues. In some places, the teacher may secure the help of a local friend of the school in setting them up and caring for them



Transplanting Seedlings.

(**6**) **Seed or Propagation Boxes.**—In order to secure early bloom in the garden, the seeds of some kinds of flowers will have to be planted in hot beds or in boxes that are kept at the windows of the school room. A small supply of these boxes should be made by the scholars. The soil that is put into them should be clean, rich, fine and rather sharp with sand. There should be holes bored in the bottom of the box and pieces of broken flower pots in addition, to allow for good drainage and ventilation about the roots. The small seeds will require to be very lightly covered and carefully watered. When the seedlings have attained to fair size, they will need to be "pricked out" and transplanted into other boxes at a distance apart sufficient to allow them to grow into strong little plants. When the weather permits, they will be transferred to the garden with as little disturbance to their roots as possible.

Tomato, cauliflower and cabbage plants should be propagated in the same way.

HELPFUL BOOKS.

The following books have been specially selected and teachers may use the list as a guide in purchasing books for school libraries; they deal largely with the technical concerns of farming. If the teacher can lead his pupils to make a useful acquaintance with some of them he will promote the well-being of the community.

FARM LIFE AND SCHOOL GARDENING.

Nature Study and Life, Hodge. Ginn & Co., Boston, $1.50.
The Outlook to Nature, Bailey. The Macmillan Co., Toronto, $1.40.
Among Country Schools, Kern. Ginn & Co., Boston, $1.00.

BOTANY.

High School Botany, Spotton. Gage & Co., Toronto, 60c.
The Farm Weeds of Canada, published by Dominion Government, free.
Experiments with Plants, Osterhout. The Macmillan Co., Toronto, $1.25.
Botany, an elementary text-book, Bailey. The Macmillan Co., $1.10.
Agricultural Botany, Percival. Henry Holt & Co., New York, $1.75.

HORTICULTURE.

Nursery Book, Bailey. The Macmillan Co., $1.50.
Principles of Fruit-growing, Bailey. The Macmillan Co., $1.25.
Vegetable Gardening, Green. Webb Pub. Co., St. Paul, $1.00.
Landscape Gardening, Waugh. Orange Judd Co., N.Y., 50c.
Flowers and How to Grow Them, Rexford. James Vick, Rochester, $1.00.

FIELD HUSBANDRY.

The Cereals in America, Hunt. Orange Judd Co., N.Y., $1.75.
Forage Crops, Voorhees. The Macmillan Co., $1.50.
The Story of the Plants, Grant Allen. D. Appleton & Co., New York, 40c.
Agriculture, James. Morang & Co., Toronto, 30c.
Principles of Agriculture, Bailey. The Macmillan Co.
Farm Buildings, Scott. Crosby, Lockwood & Son, London.

PHYSICS.

The Soil, King. The Macmillan Co., 50c.

Engineering for Land Drainage, Elliott. Wiley & Sons, New York, $1.50.

Surveying, Baker & Dickson. Crosby, Lockwood & Son, London, 50 cents.

Meteorology, Davis. Ginn & Co., $2.50.

ENTOMOLOGY.

Manual for the Study of Insects. Comstock Pub. Co., Ithaca, N.Y., $3.75.

Insects Injurious to Fruits, Saunders. Lippincott & Co., Philadelphia, $2.00.

Insects Injurious to Vegetables, Chiltenden. Orange Judd Co., N. Y., $1.50.

Insects Injurious to Staple Crops, Sanderson. Wiley & Sons, New York, $1.50.

Outdoor Studies, Needham. American Book Co., New York, 40c.

ANIMAL HUSBANDRY.

Types and Breeds of Farm Animals, Plumb. Ginn & Co., $2.00.

Principles of Breeding, Davenport. Ginn & Co., $2.50.

Judging Live Stock, Craig. Published by the author, Des Moines, Iowa, $1.25.

Feeds and Feeding, Henry. Orange Judd Co., $2.00.

DAIRY HUSBANDRY.

The Elements of Dairying, Decker. Published by author, Columbus, Ohio, $1.00.

Cheese-making, Decker. Published by author, Columbus, Ohio, $1.50.

Testing Milk and Its Products, Farrington and Woll. Mendolla Book Co., Madison, Wis., $1.00.

Canadian Dairying, Dean. Briggs, Toronto, $1.00.

The Business of Dairying. Lane.

The Creamery Patrons' Handbook, Various Authors.

POULTRY.

First Lessons in Poultry Keeping. Poultry Pub. Co., 50c.

Second Lessons in Poultry Keeping. Poultry Pub. Co., 50c.

Poultry Craft, Robinson.

CHEMISTRY.

Sanitary and Applied Chemistry, Bailey. The Macmillan Co., $1.40.

Chemistry of the Farm, Warington (first five chapters). Vinton & Co., Ltd., London, $1.00.

Fertilizers, Voorhees. The Macmillan Co., $1.50.

Plant Life, Masters. Vinton & Co., London, 90c.

BACTERIOLOGY.

Agricultural Bacteriology, Conn. P. Blakiston & Co., Phila., $2.50.

Bacteria in Relation to Country Life, Lipman. The Macmillan Co.

Bacteria, Yeasts and Moulds in the Home, Conn. Ginn & Co.

FORESTRY.

A First Book of Forestry, Roth. Ginn & Co., $1.00.

Bulletin No. 24. Forest Service, U.S. Dept. of Agriculture, 35c.

Sylvan Ontario, Muldrew. Briggs, Toronto, 50c.

FARM CARPENTRY.

Woodworking for Beginners, Wheeler. Putnam Sons, New York, $2.50.

Benchwork, Goss. Ginn & Co., Boston, 70c.

Every Man's Own Mechanic, Spon. Ward, Lock & Co., London, $2.00.

American Boys' Handy Book on What to Do and How to Do It. Beard.

HOUSEHOLD SCIENCE.

The Science and Art of Breadmaking, Jago-Simkin. Marshall Kent & Co.

Canning and Preserving, Duckwell. Pittsburg Printing Co.

Human Foods, Snyder. The Macmillan Co.

A Cook Book for Nurses, Hill. Whitcomb and Barrows.

The Cost of Food, Richards. Wiley & Sons.

The Cost of Living, Richards. Wiley & Sons.

The Cost of Shelter, Richards. Wiley & Sons.

SUPPLY OF TEACHERS.

ELEMENTARY AGRICULTURE AND HORTICULTURE.

By arrangement with the Minister of Agriculture, the Minister of Education has established a course at the Ontario Agricultural College, Guelph, in order to provide teachers with second-class certificates, competent to give instruction in Elementary Agriculture and Horticulture in addition to the ordinary subjects of the Public and Separate School Course. At the session just closed, a considerable number obtained certificates in these subjects and are now open to engagement by School Boards, which may obtain their services by advertisement or on application to the Deputy Minister of Education, who will supply a list of such teachers with their addresses.

July, 1909.